



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/813,439	03/31/2004	Sung-Sok Choi	SEC.1140	3777
20987	7590	11/30/2005	EXAMINER	
VOLENTINE FRANCOS, & WHITT PLLC ONE FREEDOM SQUARE 11951 FREEDOM DRIVE SUITE 1260 RESTON, VA 20190			ZERVIGON, RUDY	
			ART UNIT	PAPER NUMBER
			1763	

DATE MAILED: 11/30/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/813,439

Applicant(s)

CHOI ET AL.

Examiner

Rudy Zervigon

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 September 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 7,8 and 13-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 9-13 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 2-5, 9-113 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 2-5 recite “the electrode”. Which electrode “upper electrode”, “plate electrode”, or “electrode plate” ?
3. Claim 5 recites the limitation “electrode plate”. There is insufficient antecedent basis for this limitation in the claim.
4. Claims 9-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 9 recite “the nozzle”. Which nozzle “central nozzle”, or “edge nozzle” ?
5. Claim 11 recites the limitation “said valves”. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim; Byong-dong et al. (US 5,990,016 A). Kim teaches an upper electrode (71/81; Figure 7, column 4, line 49 –

Art Unit: 1763

column 5, line 22) for supplying process gas onto a wafer (13; Figure 7) in semiconductor device manufacturing equipment (Figure 7, column 4, line 49 - column 5, line 22), comprising: a plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22), and a plurality of nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) integral with said plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) so as to inject process gas supplied at one side of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) into a processing chamber (column 5, lines 9-10) from the other side of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22), said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) being configured to inject the process gas at a flow rate that is higher overall at a peripheral portion of said plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) than at a central portion of said plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) located radially inwardly of the peripheral portion (column 5, lines 10-33), as claimed by claim 1

Kim further teaches:

- i. The electrode as claimed in 1, wherein said plurality of nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) are identical with respect to their configurations such that said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) will inject the process gas at equal flow rates, and the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) are disposed more densely at the outer peripheral portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) than at the central portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22), as claimed by claim 2.

Art Unit: 1763

- ii. The electrode as claimed in 1, wherein said plurality of nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) include nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) at the outer peripheral portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), and a nozzle at the central portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), and the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) at the outer peripheral portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) have configurations that are different from the nozzle at the central portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), each of said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) at the outer peripheral portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22) being configured (column 5, lines 10-33) to inject the process gas at a higher flow rate than the nozzle at the central portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), as claimed by claim 3
- iii. The electrode as claimed in 3, wherein said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) at the peripheral portion of the electrode plate (71/81; Figure 7, column 4, line 49 - column 5,line22) are arrayed in at least one concentric group (Figure 8) centered about the nozzle at the central portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), and the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) within each said group (Figure 8) have the same configurations so as to inject the process gas at the same flow rate (column 5, lines 10-33), as claimed by claim 4
- iv. The electrode as claimed in 3, wherein said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) at the peripheral portion of the electrode plate (71/81; Figure 7, column 4, line

Art Unit: 1763

49 - column 5,line22) have through-holes (82, 82a; Figure 8, column 4, line 49 - column 5,line22) that are larger (column 5, lines 10-33) than those of the nozzle at the central portion of the plate electrode (71/81; Figure 7, column 4, line 49 - column 5,line22), as claimed by claim 5

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim; Byong-dong et al. (US 5,990,016 A) in view of Strang; Eric J. (US 6,872,259 B2). Kim is discussed above.

Kim does not teach:

i. Semiconductor manufacturing equipment, comprising: a processing chamber (column 5, lines 9-10); a supply line (not shown; inherent; Figure 8) through which process gas is supplied to Kim's chamber (column 5, lines 9-10); Kim's central nozzle (82; Figure 8) disposed at an upper part of Kim's chamber (column 5, lines 9-10); a plurality of edge nozzles (82a; Figure 8, column 4, line 49 - column 5,line22) disposed at the upper part of Kim's chamber (column 5, lines 9-10) at peripheral locations, respectively, disposed at equal intervals (column 5, lines 10-33) from each other along a circle whose center coincides with Kim's central nozzle (82; Figure 8); a controllable distributor operatively interposed between said supply line (not shown; inherent; Figure 8) and said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5,line22) so

Art Unit: 1763

as to control the flow of the process gas from the supply line (not shown; inherent; Figure 8) to the nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22); an exhaust system connected to said processing chamber (column 5, lines 9-10) to create a vacuum within the chamber (column 5, lines 9-10); a pressure sensor that measures the pressure in the chamber (column 5, lines 9-10) interior; a database that stores information regarding the processing of a wafer (13; Figure 7) within Kim's chamber (column 5, lines 9-10); and a controller operatively connected to said database so as to receive the information stored by the database, operatively connected to said pressure sensor and said exhaust system so as to control the exhaust system to regulate the pressure within the chamber (column 5, lines 9-10) on the basis of the pressure sensed by said sensor, and operatively connected to said distributor for controlling the distributor to regulate the flow of the process gas to said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22), as claimed by claim 9

ii. The equipment as claimed in 9, wherein the distributor comprises: pipes diverging from the supply line (not shown; inherent; Figure 8) and each connected to a respective one of the central nozzle (82; Figure 8) and the edge nozzles (82a; Figure 8, column 4, line 49 - column 5, line 22); and a control valve disposed in-line with the divergent pipes, and operatively connected to said controller, as claimed by claim 10

iii. The equipment as claimed in 9, wherein the distributor comprises: a support plate disposed above said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22); and control members supported by said support plate so as to be movable in a direction towards and away from said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22); and an elevating mechanism operatively connected to said control members so as to position said

Art Unit: 1763

control members relative to said valves, said elevating mechanism being operatively connected to said controller, as claimed by claim 11

iv. The equipment as claimed in 11, and further comprising a plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) with which said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) are integrated, said having a plurality of grooves extending from an upper surface thereof to each of said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22), respectively, and wherein each of said control members has a lower end having a shape corresponding to the shape of a respective one of said grooves and is disposed opposite thereto, whereby the control members can be seated in said grooves, as claimed by claim 12

Strang teaches a controllable distributor (Figure 3G) operatively interposed between said supply line (74', 74'', 74'''; Figure 3G) and said nozzles (160; Figure 3G-I) so as to control the flow of the process gas from the supply line (74', 74'', 74'''; Figure 3G) to the nozzles (160; Figure 3G-I); an exhaust system (66; Figure 2B) connected to said processing chamber (14; Figure 2B) to create a vacuum within the chamber (14; Figure 2B); a pressure sensor (column 17, lines 27-40) that measures the pressure in the chamber (14; Figure 2B) interior; a database (80; Figure 2B) that stores information regarding the processing of a wafer (13; Figure 7) within Strang's chamber (14; Figure 2B); and a controller (80; Figure 2B) operatively connected to said database (80; Figure 2B) so as to receive the information stored by the database (80; Figure 2B), operatively connected to said pressure sensor (column 17, lines 27-40) and said exhaust system (66; Figure 2B) so as to control the exhaust system (66; Figure 2B) to regulate the pressure within the chamber (14; Figure 2B) on the basis of the pressure sensed by said sensor, and operatively

Art Unit: 1763

connected to said distributor (Figure 3G) for controlling the distributor (Figure 3G) to regulate the flow of the process gas to said nozzles (160; Figure 3G-I), as claimed by claim 9

v. The equipment as claimed in 9, wherein the distributor (Figure 3G) comprises: pipes (150', 150'', 150'''; Figure 3G) diverging from the supply line (74', 74'', 74'''; Figure 3G) and each connected to a respective one of the central nozzle (160; Figure 3G) and the edge nozzles (160; Figure 3G); and a control valve (154; Figure 3C,G) disposed in-line with the divergent pipes (150', 150'', 150'''; Figure 3G), and operatively connected to said controller (80; Figure 2B), as claimed by claim 10

vi. The equipment as claimed in 9, wherein the distributor (Figure 3G) comprises: a support plate (154; Figure 3C,G) disposed above said nozzles (160; Figure 3G-I); and control members (160L; Figure 3B) supported by said support plate (154; Figure 3C,G) so as to be movable in a direction towards and away from said nozzles (160; Figure 3G-I); and an elevating mechanism (180; Figure 3B) operatively connected to said control members (160L; Figure 3B) so as to position said control members (160L; Figure 3B) relative to said valves (154; Figure 3C,G), said elevating mechanism (180; Figure 3B) being operatively connected to said controller (80; Figure 2B), as claimed by claim 11

vii. The equipment as claimed in 11, and further comprising a plate electrode (90; Figure 2B) with which said nozzles (160; Figure 3G-I) are integrated, said having a plurality of grooves (166i; Figure 3I) extending from an upper surface thereof to each of said nozzles (160; Figure 3G-I), respectively, and wherein each of said control members (160L; Figure 3B) has a lower end having a shape corresponding to the shape of a respective one of said grooves (166i; Figure

Art Unit: 1763

3I) and is disposed opposite thereto, whereby the control members (160L; Figure 3B) can be seated in said grooves (166i; Figure 3I), as claimed by claim 12

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Strang's Strang teaches a controllable distributor (Figure 3G) to Kim's apparatus.

Motivation to add Strang's Strang teaches a controllable distributor (Figure 3G) to Kim's apparatus is for improving etching and deposition processes as taught by Strang (column 8; lines 30-40).

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim; Byong-dong et al. (US 5,990,016 A) and Strang; Eric J. (US 6,872,259 B2) in view of Omstead; Thomas R. et al. (US 6,692,575 B1). Kim and Strang are discussed above. None of Kim or Strang teach: the equipment as claimed in 9, the distributor comprises: an adjustable control plate disposed on said plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22) so as to be rotatable in a circumferential direction of said plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22), and having through-holes (82, 82a; Figure 8, column 4, line 49 - column 5, line 22) each corresponding to a respective one of said nozzles (82, 82a; Figure 8, column 4, line 49 - column 5, line 22); and a rotary drive mechanism supported by the electrode plate (71/81; Figure 7, column 4, line 49 - column 5, line 22) and operatively connected to said control plate so as to position the control plate in the circumferential direction relative to said plate electrode (71/81; Figure 7, column 4, line 49 - column 5, line 22), as claimed by claim 13

Omstead teaches a rotary drive mechanism (170; column 16, line 59 – column 17, line 10) for a gas distribution assembly (Figure 12A,B) including an adjustable control plate (160; Figure 12A)

Art Unit: 1763

disposed on a second plate (166; Figure 12A) so as to be rotatable in a circumferential direction of said second plate.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add Omstead's gas distribution assembly to Kim's apparatus.

Motivation to add Omstead's gas distribution assembly to Kim's apparatus is for adjusting process gas flows as taught by Omstead (column 17, lines 11-25).

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official fax phone number for the 1763 art unit is (703) 872-9306. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272-1435.



Rudy Zervigon
11/28/15